FOREST INSECT CONDITIONS
HAYSTACK BURN
KLAMATH NATIONAL FOREST, CALIFORNIA
APPRAISAL SURVEY, MARCH 1958

Introduction

Late in September, 1957, the Station received a detection report from the Klamath National Forest and the Regional Office, Forest Service, calling our attention to a serious buildup of insects in the Haystack Burn area on the Klamath. On October 29-31, R.C. Hall from the Station and J.L. Averell from the Region made an inspection of the area and confirmed the serious character of the infestation. Arrangements were then made for a more intensive appraisal of the situation early in the spring of 1958.

This survey was carried out during the week of March 2, 1958, and was a cooperative endeavor, with foresters from the Western Pine Association, Fruit Growers Supply Company, Southern Pacific Land Company, the California State Division of Forestry, the Klamath National Forest, and entomologists from the California Forest and Range Experiment Station participating. The crew averaged in the neighborhood of 25 men, and the field work was completed in 4 days. The survey was under the supervision of R.C. Hall and the Station forest insect survey staff.

Objectives

As presented in the plan for the survey,[1/] the primary objective was to evaluate the biological significance of the insect situation. This included the overall extent of the infestation, its intensity, and trend - whether it appeared to be on the downgrade, static, or increasing. A second objective, not specifically designated in the plan, was to determine the relative intensity of loss within different parts of the infested area as a guide for subsequent control work, should it appear necessary.

Infestation Area

The area under consideration includes the Haystack Burn and surrounding unburned timberland. The burn, north and west of Yreka, California, occurred in September 1955 and covered some 70,000 acres on both sides of the Klamath River. The whole area is exceedingly rough, and varies in elevation from 1,600 feet along the Klamath River to over 5,500 feet on the ridges. It is interesting to note that this is the area in which California's first major bark-beetle control project was carried out, in 1911 and 1912.

Ponderosa pine is the main timber species in the bottoms and on the south and west slopes, with a lesser percentage of sugar pine intermixed. On the upper north and east slopes, Douglas-fir and white fir predominate, while

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1/ Stevens, Robert E. Study plan for Haystack Burn appraisal survey. CF&RES. Feb. 11, 1958. 2 pp. Mimeo.

pine extends part way up the slopes. There are sizeable bare patches on south slopes, and within the burn extensive areas occur where the fire killed all the timber. Despite extensive salvage operations, heavy bark-beetle populations developed in residual timber too small or too inaccessible to be logged. It was with the infestation in this material that this survey was concerned.

At the time of the survey, early March, there was snow in the upper elevations. This, along with washouts in the roads, made for considerable hiking to get into parts of the survey area.

Insect and Host Species

The primary problem involved in the infestation is the western pine beetle, Dendroctonus brevicomis Lec., killing ponderosa pine. Of lesser importance are the mountain pine beetle, D. monticolae Hopk. in sugar pine, and the Douglas-fir beetle, D. pseudotsugae Hopk. and the flatheaded fir borer, Melanophila drummondi (Kby.) in Douglas-fir. Douglas-fir loss was noted only in trees that were badly fire-scorched, and the loss in sugar pine is probably not heavier than under normal conditions.

Survey Methods

Obtaining the information called for in the objectives required sampling conditions throughout the infestation area. To do this, the overall area was delineated by the Klamath National Forest in late January 1958, on the basis of the 1955 burn boundaries and current ground and air reconnaissances. Areas of brush and 100 percent kill by the burn were excluded. The map prepared on this basis was used by Station entomologists in setting up the survey units. These units, of which there are 15, are shown on the accompanying outline map, which overlays the 1955 USFS Yreka and Seiad District map. The acreage for each unit was estimated with a dot-grid, and from this was computed the number of $\frac{1}{2}$-acre circular plots necessary to obtain a $2\frac{1}{2}$-percent sample. Plots were established at 5-chain intervals along lines running through the survey units. Sample lines were generally selected in the field, considering topography, snow, and current road conditions. A good deal of help in this phase of the work was received from the local foresters on the crew.

Data gathered at each plot included (1) the number and diameter (to the nearest even inch) of currently infested trees, and (2) the number and diameter of trees killed by the last complete 1957 generation of beetles.

Distinguishing trees killed by the last 1957 generation was much more difficult than distinguishing currently infested ones, hence the two sets of data cannot be considered equally reliable. However, this is the only way that the trend of the infestation can be estimated. Most of the currently infested trees, incidentally, had begun to fade at the time the survey was made. Some were completely green and could be detected only by noticing woodpecker work.

On the morning of March 3, the crew assembled at the Yreka CDF headquarters and was given instructions by R.C. Hall on the objectives of the project and

gathering of the data. From there the group went to the Greenhorn Creek area and spent the remainder of the morning examining infested trees in order to make sure everyone was acquainted with the insects and damage involved. The afternoon was spent with the group broken down into 4 crews, each with a Station entomologist, running lines of plots through unit 1. This completed the training, and thereafter 2-man crews were used to run the majority of the lines. The entire group met each morning for instructions, either at the Yreka CDF headquarters or at the Oak Knoll Ranger Station, inasmuch as scheduling much work very far in advance was affected by the amount of work accomplished on a particular day, daily improvement in road conditions, and changes in the crew makeup.

Status of the Infestation

Table 1 presents the overall findings of the survey. The data are segregated into the units as shown on the map, and further into two categories, one north and the other south of the Klamath River. Table 2 shows the numbers of currently infested trees and recently abandoned trees obtained on the same plots.

Table 1.--Summary of infested trees and volume
Haystack infestation, 1958

Unit	Acres in unit	Infested vol. ave. bd.-ft. per acre	Infested trees no. per acre	Size of ave. tree d.b.h. inches	No. plots
		South of the Klamath River			
1	2,400	210 ± 67	.56 ± .12	16	143
2	480	No loss on plots	-	-	11
3	3,520	244 ± 57	.71 ± .17	20	173
4	480	Not sampled	-	-	-
5	3,680	410 ± 115	.72 ± .18	23	179
6	320	Not sampled	-	-	-
7	2,720	74 ± 31	.13 ± .04	24	156
8	1,920	24 ± 4	.16 ± .08	13	152
Indian Creek	1,760	48 ± 30	.08 ± .04	26	217
Total	17,280				1,031
Ave.		170 ± 26	.39 ± .05	21	
		North of the Klamath River			
9	3,200	74 ± 31	.17 ± .04	24	216
10	1,760	32 ± 16	.11 ± .065	16	95
11	2,560	124 ± 40	.13 ± .033	24	208
12	1,120	93 ± 75	.13 ± .110	24	15
13	250	No loss in plots	-	-	15
Doggett	6,240	72 ± 36	.16 ± .061	28	187
Total	15,130				736
Ave.		81 ± 18	.13 ± .022		
Average both areas		132 ± 17	.28 ± .031		

Table 2.--Numbers of currently infested and recently abandoned trees - Haystack infestation, 1958

Unit	Currently infested	Recently abandoned
1	41	31
2	1	13
3	62	48
4	-	-
5	62	21
6	-	-
7	8	2
8	3	2
9	8	9
10	4	1
11	14	9
12	1	1
13	-	-
Doggett Creek	5	4
Indian Creek	6	6
Total	215	147

While the overall picture of current loss can be obtained from table 1, it may be worthwhile to point out a few additional facts. First, the data indicate that there are a total of nearly 9,000 infested trees in the area, with a volume of over 4.1 million board-feet.

The survey showed that most of the loss is inside the burn perimeter. The number and volume of currently infested trees is greatest in units 1, 3 and 5; the estimated per-acre volume infested in these units ranges from 210 to 410 board-feet. Losses of this magnitude are of epidemic proportions. Losses are also high in units 7,9, 11 and 12, ranging from 74 to 124 board-feet per acre, but are not generally as great in the remainder of the units. While the board-foot volume loss in the lighter areas may not be great, in terms of percent of green stand remaining it may be very high in some locations. Few trees escaped the fire in certain areas, and only a light residual stand remains.

As seen from table 2, currently infested trees outnumber recently abandoned ones overall by a ratio of about 1.46 to 1. On the three heavily infested units the ratio is higher - 1.65 infested trees for each recently abandoned one. Any error in distinguishing recently abandoned trees, which was mentioned earlier under "Survey Methods", would increase the spread - that is, the number of recently abandoned trees would be if anything reduced, increasing the infested/abandoned ratio. The conclusion that can be made from this is that the infestation does not appear to be on the downgrade and the prediction that follows is that considerable loss will continue this year, particularly in the heavily infested units, unless some sort of control work

is done. In local areas where fire and insects have practically eliminated the stand, of course, losses may be expected to diminish because of lack of host material.

Control Possibilities

The only area where the infestation constitutes a serious threat to nearby green timber occurs in unit 1. In the western part of this unit there is a good chance for the infestation to spread into the unburned stand south of Greenhorn Creek if no steps are taken to control the beetles. In the remaining units the infestation as a whole is not seriously endangering unburned green timber. The area to the east of the burn is not timbered, and the heavily infested units 3 and 5 are separated from green timber to the west by burn, several miles, and high ridges with fir on the eastern slopes.

The moderately infested units, 7, 9, 11 and 12, while sustaining heavier-than-normal loss, have not up to this point developed bark beetle populations of alarming proportions. However, they should be watched closely throughout the coming year for any signs of increased activity.

In the light units the quantity of infested material is not serious and constitutes neither abnormal drain nor a threat to surrounding green timber. While there may be local areas within these units that for economic reasons should be salvaged, from an entomological standpoint the problem here is insignificant.

In the three heavily infested units, losses in the residual stand could probably be reduced either by salvaging infested trees or other direct control techniques. Salvage offers the most economical prospect and should be promoted wherever possible. As a rule, though, salvage alone will not remove all the infested trees. Consequently, it becomes necessary to use other direct methods to eliminate trees that are too small or too scattered for logging. Direct control in units 3 and 5 would be exceedingly expensive because of the terrain. Inasmuch as these areas are not considered to be a threat to stands outside the burn, possibly only salvage should be considered for them. Regardless of whether salvaging infested trees or other direct methods are used, any action aimed at destroying the beetles now in the trees should be completed by May 1.

Because of the small size of the trees in Unit 1, and the fact that this unit is one in which the infestation is a threat to green stands, direct control might reasonably be employed. Based on our experience in similar situations, we estimate the cost of treating each tree, either by fell-peel-burn or fell-spray methods to be between $15 and $20. We estimate there are about 900 infested trees in this area needing control. If direct control is employed, instructions for the fell-spray method can be found in CF&RES Misc. Paper No. 17, "Ethylene Dibromide for Controlling Bark Beetles in California," by G.L. Downing. Keen's "Insect Enemies of Western Forests" describes fell-peel-burn techniques on page 234.

Acknowledgments

This survey was a good example of government and industry pitching in together to accomplish a job, and the Station wishes to acknowledge the help of the cooperators. Without their help the project would have been much more difficult and time-consuming. The following men participated in the field work:

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- John Brannon

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- John Murray
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- Earl Young
- Cotton Mason
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- Boyd Wickman
- Robt. Stevens

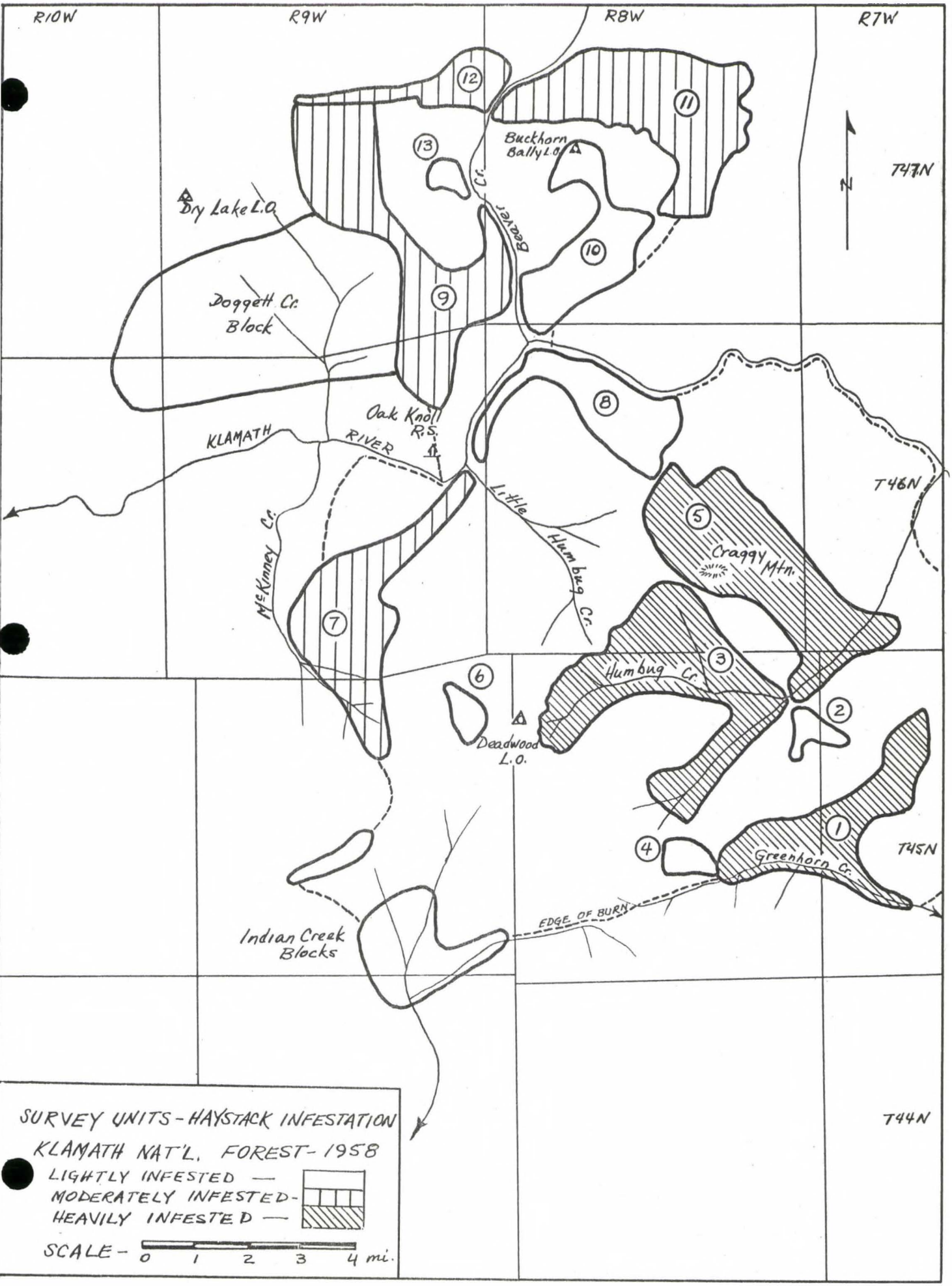
Dale Prentice arranged the participation by industry foresters; William Gerson, Timber Staff Officer on the Klamath, handled the administrative work for the Forest Service; and Forest Technicians Dan Dotta, Jim Denney and Larry Ritchie took care of the same details for the State. Roy Bengard, State Forest Ranger, provided facilities for training and subsequent meetings.

Attachments

Robert E. Stevens
Ralph C. Hall,
Entomologists

Berkeley, California
March 28, 1958

Agriculture--Forest Service, Berkeley, Calif.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1
Buckhorn Bally L.O.
Dry Lake L.O.
Beaver Cr.
Doggett Cr. Block
Oak Knoll R.S.
KLAMATH RIVER
McKinney Cr.
Little Humbug Cr.
Craggy Mtn.
Humbug Cr.
Deadwood L.O.
Greenhorn Cr.
EDGE OF BURN
Indian Creek Blocks
SURVEY UNITS - HAYSTACK INFESTATION
KLAMATH NAT'L. FOREST - 1958
LIGHTLY INFESTED —
MODERATELY INFESTED -
HEAVILY INFESTED —
SCALE - 0 1 2 3 4 mi.